The Air Line Pilot

February, 1952

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Airline Pilots Look at Safety

Capt. W. W. Moss, Pan American World Airways.
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Airline Pilots Look at Safety

by Captain William W. Moss, ALPA

William Moss, Pan American World Airways captain, is an ALPA member who manages to round out his full-time duties as pilot with a great deal of committee work. He is Chairman of the Council 36 Air Safety Committee, a member of the ALPA Jet Prototype Studies Committee, and ALPA representative on the CAA-CAB Transport Aircraft Performance Re-evaluation Committee.

At 37, Moss has logged some 12,000 flight hours, made more than 230 trans-Atlantic flights. He joined Pan American in 1939 after 4 years as a Navy dive bomber pilot.

Captain Moss delivered the following address at the 20th annual meeting of the Institute of the Aeronautical Sciences, January 28-February 1, 1952:

Safety of airline transportation is important in a great many ways, the most important of which is the moral responsibility to the traveling public. In this paper, however, a narrower and more personal viewpoint will be examined, that of the active airline pilots.

Safety to a pilot is extremely important in a personal sense. As the "man out front" he is vitally concerned with his own survival as well as with his primary assigned responsibility for the safety of his passengers and crew. He is also vitally affected by the impact of safety on his own airline particularly and the industry in general. His employment security, his opportunities for promotion, his pay, his choice of domicile, and his working conditions in general are all affected by the impact of the level of safety on the public's demand for air transportation. The effect of accidents is hard to judge but the following is typical.

On a flight the day after a well publicized non-scheduled crash recently, the author had the opportunity to talk extensively with the small number of passengers aboard. During the conversations it developed that a significant percentage were nervous about the flight, and several mentioned that they had almost cancelled their reservations in favor of going by boat. How many of the empty seats were due to this cause is hard to determine, but Lederer (J. Lederer, S.A.E. National Aeronautic Meeting, 1951) has said:

> "The traffic department of another large airline, after studying its variation of traffic with accidents, concludes that the effects of a well publicized accident or series of accidents are felt for about two months. It results in an average loss of 10 per cent in passenger revenue during this period. This loss, at present levels of traffic, would amount to $1,700,000 for this one airline."

This form of measurement, however, touches only the effect on those who already travel by air. It takes little or no account of the potential air travelers who, because of fear, have never set foot in an airplane. It is a reasonable guess that the horizons of air transportation could be broadened considerably by a marked improvement in the safety record.

The Past and Present

In assessing safety, it is necessary to know where we are and where we have been. Figure 1, "Accidents and Fatal Accidents per 100 Million Plane Miles" shows this. The author has chosen the parameters of plane miles and accidents rather than the usual ones of passenger fatalities per passenger mile because it is more representative of the pilot's viewpoint. He flies many thousands of miles per year, and from his personal safety angle it matters little if there are one or one hundred passengers riding behind him. He is particularly interested, however, in what is likely to happen during the millions of miles he will fly during his career.

Figure 1 is a plot of accidents and fatal accidents per 100 million plane miles for all flying by U. S. scheduled domestic and international airlines for the years 1938-50. All figures are taken from Civil Aeronautics Board records and the Board's definition of an accident ("involving serious injury to persons and/or substantial damage to the aircraft") was used with no screening. The mileage for all types of flying, revenue, non-revenue, charter, ferry, test, and training was used, for it is obvious that the pilots were exposed to all types.

The most obvious conclusion to be drawn is that the record of both types of accidents have improved tremendously over the years, with accidents dropping from a rate of 48 to 10, and fatal accidents from approximately 8 to 1.5. This is indeed improvement.

In following the trend of the curves, several points are of significance. First is the rapid improvement in the years 1938-42. The pilots attribute this primarily to the influence of the Independent Air Safety Board. There were, of course, other factors involved, notably the wide introduction of the DC-3, but it is the pilots' opinion that a large share of this improvement was due to the many reforms and aggressive actions of the Air Safety Board during its brief life.

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W. Johnston, Editor

While it is not the purpose of this paper to indulge in the controversy which has raged for years around this board, it appears desirable to comment in passing that the pilots still believe in the principle of independence involved, even though we feel that the present CAB Safety Bureau is doing a good job. We feel that if a board composed of experts has the power of enforcement, rather than having its recommendations and policy tempered by a higher authority of non-technical membership, greater safety progress would result with marked benefit to the industry.

The second period of interest in Figure 1 is the war years, 1943-45, in which while accidents declined slightly, fatal accidents continued at a high level. This we attribute to inexperienced personnel, both flight and ground, and to the general insecurity and pressure of that period.

The third period, 1946-50, is that of the introduction of postwar equipment, notably the wide use of four engine planes for both domestic and international travel. This period is marked by a decrease in both rates, particularly the fatal one, followed by a definite level-off. Preliminary figures for 1951 confirm this stabilization, showing even a slight increase in both rates, particularly the fatal one.

One point of great significance to the pilots and one not generally appreciated is this. At the 1949-51 rate of accidents and present airplane speeds, the chances are 3 out of 4 that an airline pilot will be involved in an accident during his career. Likewise, the chances of his being involved in a fatal accident are about 1 in 9. Looking at this, we feel that, although great strides have been made in the past, improvement is necessary and due. We feel that the past improvement was made from an extremely high rate, and that the industry should not be satisfied with the present status quo.

In any analysis of accidents, it is customary to place the blame for from 45 per cent to 50 per cent of the accidents on the pilot. We feel that while, of course, many errors of omission and commission are made by pilots, being only human, there are other underlying factors, and in the remainder of this paper an attempt is made to point out areas in which some of these factors can be eliminated.

In support of this contention, a situation that developed at the Naval Air Station, Honolulu, during the war is of interest. The main seaplane operating runways were to the northeast and east, crossing at a point approximately one thousand feet from their origins. Lighting was furnished by permanent lights on poles some six to ten feet above water level. About two months after the commencement

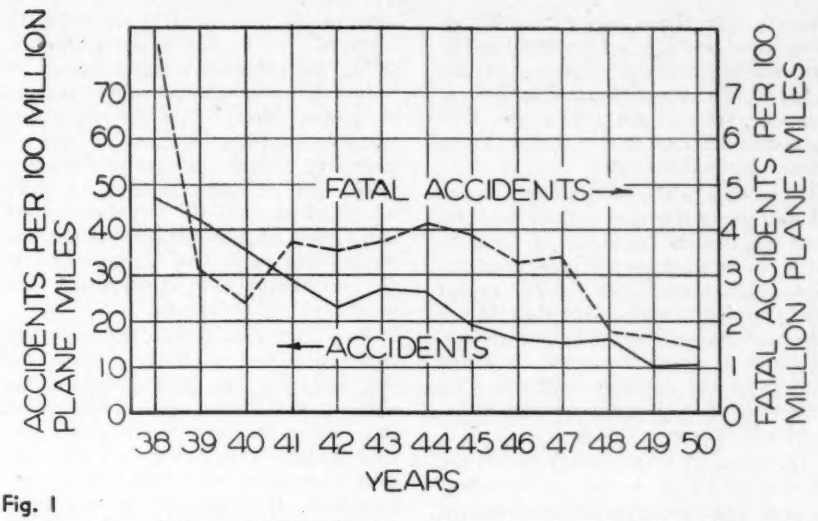


Fig. 1

of operations, during a night take-off, a Navy pilot tore the bottom out of a PBM on the coral reef beyond the intersection of the two runways. The verdict was "pilot error," a finding concurred in tacitly at least by the majority of pilots flying in and out of the area. About a month later a commercial airline pilot did the same thing with a PB2Y. The plane rested on the reef most of that day and was removed just before sunset. Before sunrise there was another PB2Y on the reef within 50 yards of where the first had been.

Now, each of those accidents, by itself, could be attributed to "pilot error." However, with an accident pattern established it seemed likely that there was a contributing factor. Investigation showed that the errors of runway alignment were due to the confusion of the runway lights, on their poles at a considerable height, with the lights of Honolulu, in the background. The lighting system was then modified to reduce this confusion, and it is significant that there were no more similar accidents.

Design

Furthering this principle of outside influence as a cause of "pilot error," it would appear that the airplane design should have quite an effect. McFarland (R. A. McFarland, Human Factors in Air Transport Design, 1946) has said:

> "The fact that accident rates vary from model to model suggests that the airplane itself may play as important a role as the human element. . . . It is commonly believed that certain air transports are generally safer to operate than others. The evaluation of such a statement is almost impossible because of the many variables involved or the lack of a common base line of comparison."

Since this statement was made, statistics have only recently become available through the CAB which make it possible to attempt such an analysis. These are presented in Figure 2, "A Comparison of the Accident Rates of Widely Used U. S. Transport Aircraft." The figures presented here apply only to scheduled flying by U. S. domestic airlines, the international figures not being available. Although there are many factors involved, it is felt that the variables of crew competence, maintenance, and operational techniques are largely eliminated through the close CAA supervision and regulation of the scheduled airlines.

In analyzing the data, it is significant in the case of the twin engine planes to note the marked correlation between the accident rate and the accumulated mileage, and the lack of correlation between the accident rate and the period of years over which the planes flew. This leads to the conclusion that it is the original design and its development as accumulated mileage shows up weak points that determine the safety level rather than the skill of the pilots. If the latter were a major determining factor there should be some correlation of years of service with the accident rate. It is a fact, however, that piloting technique becomes soon stabilized on each type of plane and varies but little over the years and the pilots quickly become proficient in it.

In looking at the fatal accident rates, it is noteworthy that there are four types with perfect safety records. Most significant of these is the CV-240, although the accumulated mileage of the other three is sufficient to take their combined record out of the realm of pure chance. By all averages the CV-240 should have had three fatal accidents. In fact, it has had six very serious accidents but in all the survival rate has been 100%. This suggests strongly that there are factors inherent in the design which account for this remarkable record. A complete exam-

ination into these factors would appear to be one of great potential industry benefit, however it is out of the scope of this paper. In passing, though, the suggestion is made that the slow spread of after-crash fire is one of the major survival reasons.

In looking at the modern four engine planes, the uniformity of their accident rate suggests the influence of CAR 04 with its detailed performance and design requirements. It would appear that, although each plane has its individual characteristics, the overall level of safety is about the same, bounded as it is by the parameters of 04. This influence of regulation on the safety level will be covered later.

If we accept the principle of the marked effect of design on the safety record, and, by inference at least, its effect on "pilot error" accidents, what are some areas that warrant attention? Two suggestions will be made.

Over the thirteen year period of this study, there have been some 47 accidents due to misuse of the landing gear, either retracting it when on the ground or landing with the gear not down and locked. While these accidents are not fatal ones, they are expensive, both as to damage to equipment and as to loss of utilization. In one recent case the president of the airline has been quoted as calling it a "million dollar mistake." Obviously, the pilots don't cause these accidents on purpose, and as there is a definite pattern established by these there must be a basis for confusion of controls within the cockpit. What can be done to make it impossible for these accidents to happen? Already we have various solenoid pin arrangements whose purpose is to prevent the inadvertent retraction of the gear on the ground, but by this time they are obviously proved to be not 100% effective. It is equally obvious that the landing gear warning horn does not deter people from landing with the gear neatly retracted. Howard (B. O. Howard, V. P. Consolidated Vultee, 1951) has proposed a system which involves "shoe strings and rubber bands," the "shoe strings" to tie component controls together so that it will be necessary to make two consecutive mistakes with different controls to cause an accident, and the "rubber bands" the bypass arrangement so that it will be possible to actuate controls out of the normal sequence if necessary, such as during a "go-around."

Basically, his system involves the interconnection of landing gear and flap levers so that it would be impossible to put down more than takeoff flap unless the gear were down and also make it impossible to raise the gear when more than takeoff flaps were extended. It would also be impossible to raise the flaps above the takeoff position after takeoff unless the gear were up. This interdependence would accomplish this: 1) in order to land without the gear down, it would be necessary to forget *both* the gear and the flaps, an unlikely coincidence. In Howard's estimate, this coincidence would occur only once every 196,000,000 landings—about 150 years of domestic airline operation. 2) It would be impossible to raise the gear on the ground, thinking that it was the flaps that were being raised. 3) It would be impossible to raise the flaps immediately after breaking ground on takeoff instead of the gear, a very dangerous procedure with present high wing loadings.

In addition to this interconnection, he would interconnect the flaps and throttles, much as is now done with the throttles and flight control lock, to prevent a takeoff with flaps up. That this is an important point is attested by the author's personal experience of having made such a takeoff in a D-C4, in spite of an unhurried reading of the check list with both another Captain and a Fight Engineer in the cockpit and participating. Luckily there was ample runway available, but under conditions of minimum field length with the high wing loadings now used such a takeoff could very easily be catastrophic.

By putting into practice some such ideas, it should be possible to eliminate 7.5% of all accidents and 12.5% of those attributed to "pilot error," as well as eliminate the exposure to the no-flap takeoff hazard.

The second idea presented here is one in which the pilots have considerable faith, the mandatory use of reverse pitch propellers on all airline aircraft. In the period studied there have been some 62 accidents in which the aircraft has run beyond the field boundary, either as the result of an aborted takeoff or, more frequently, after landing. Since the introduction of reversing propellers, no aircraft equipped with them has been involved in such an accident, with one exception. In that case, the use of reverse pitch prevented a far more serious, and probably fatal, accident. We feel that they should become a required item of equipment, much as the full feathering propellers became a decade ago. Their use, in our estimation, would prevent 10% of all accidents and 21% of "pilot error" accidents.

Since the pilot is the final determinant of flight safety his help should, we feel, be actively sought in the early design stages in order to make his tasks more simple. This is occasionally being practiced, but not nearly to the extent we feel desirable. A. E. Raymond, in his excellent 39th Wilbur Wright Memorial Lecture, said, in speaking of the time of a new design's first flight:

> "Here also enters, too often for the first time, the human equation in the form of the pilot and crew. There is an increasing awareness of the fact that the experience and point of view of operating personnel should be intimately joined with that of the designer from the beginning."

And a leading manufacturer, in a personal communication to the author, wrote, in discussing the contributions made by active airline pilots to the success of the design in question:

> "The question of why there was success here and not elsewhere seems to be answered by the timing factor. This program was set up at a very early date in the development thus allowing enough time to thoroughly discuss differences of opinion and reduce them to an objective common denominator."

We wish the thoughts expressed above were more widely practiced within the industry.

In passing, it might be well to note that the Air Line Pilots Association is carrying on an active campaign of familiarization with the problems of de-

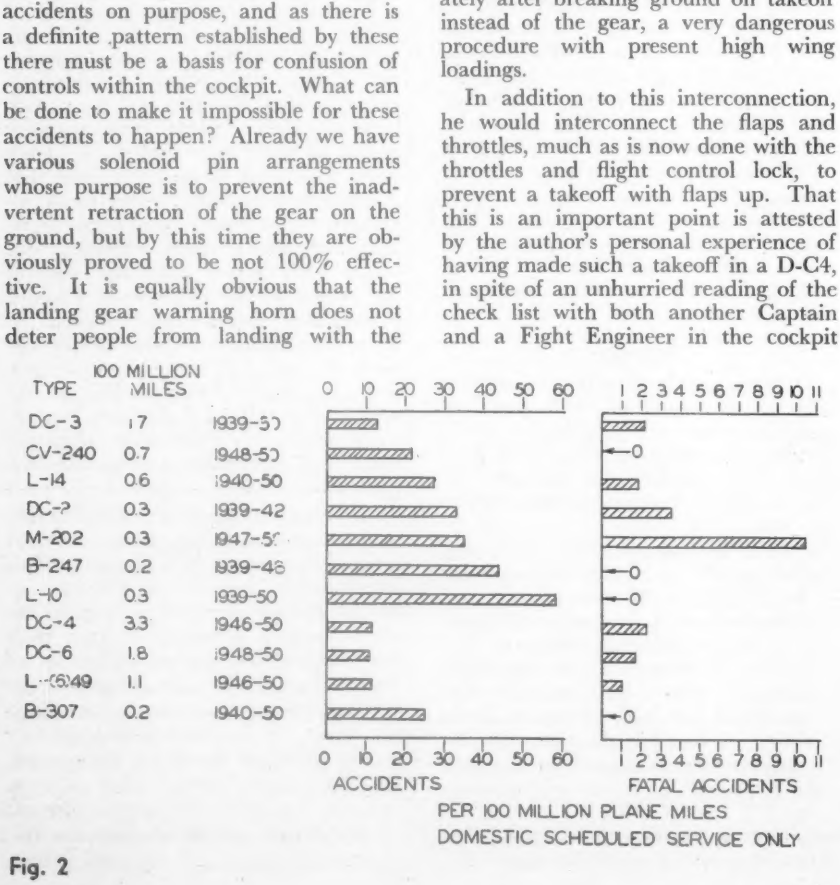


Fig. 2

sign and operation of turbine powered transports in anticipation of their early commercial application, and we would welcome the opportunity to contribute to their safe and efficient development.

Operations

Given an initially sound design, the next and very important step in making it a safe plane to fly is the "debugging" of it under actual operations. Contrary to popular opinion this process does not end with the first few years in service but extends throughout the total operating life. Figure 3, "Accident Rate as a Function of Cumulative Miles Flown," shows this clearly. Though the initial 4 or 5 hundred million miles are probably the most important, the DC-3's long history shows a continuous gradual improvement beyond that point. This initial rapid improvement is also clearly shown by the DC-4 and 6 curves, evidence of the excellent joint efforts of the manufacturer and operators. If their future development parallels that of their predecessor, and if other current transport types are improved at the same high rate as has been shown for these types, we indeed have promise of a marked improvement in the overall accident rate.

Incidentally, in the preparation of this figure it was not meant to slight other types. The aircraft plotted were chosen because their accumulated mileage in domestic scheduled service was sufficiently large to plot a reasonably smooth curve.

Also pointedly showing the effects of improvements while in service is "Accidents Caused by In-Flight Fires." The importance of this plot may be shown by the fact that accidents from this cause are twice as apt to be fatal as those from all causes.

There are three periods of note. First is the tremendous improvement in the period from 1938 to '44. The abrupt drop to the almost perfect record of 1940 through '44 can be attributed to two factors, the mandatory introduction of feathering propellers and the extremely reliable Wright and Pratt and Whitney engines in common use during that period. Of these we believe the ability to stop rotation of a failed or failing engine was undoubtedly the dominant factor.

The second interesting period is the marked jump in the curve for 1945 through '48. This was the time when the modern four engine transports, with extremely high power engines, were first put into service. The record speaks for itself in showing that the in-flight fire situation was not what it should have been when these planes were in their early development stages.

The final period is the abrupt drop off from the peak year, 1948, showing that the previously hazardous conditions have been brought under reasonable control, through the close cooperation of the manufacturers, airlines, and CAA.

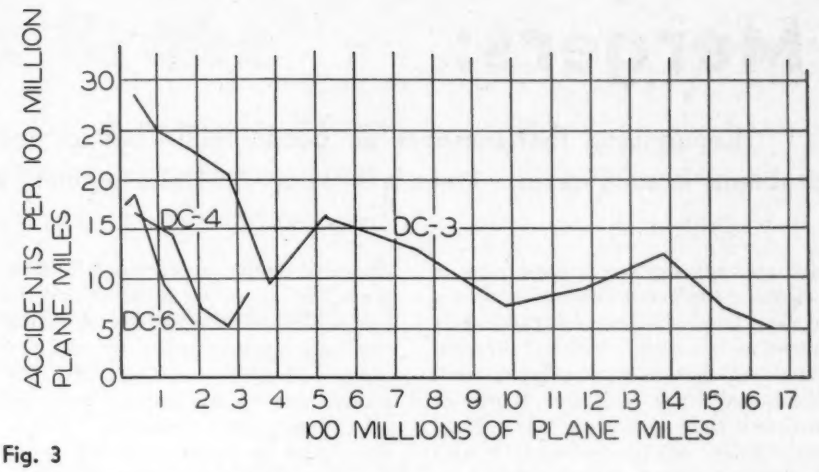


Fig. 3

There have been, however, some instances of slow or ineffective corrective efforts which have upset the pilots and often tend to becloud the really excellent general efforts. Perhaps the most spectacular one is the high incidence of uncontrollable engine fires in a widely used modern transport. In 1945, in the military prototype, the first such incident occurred, resulting in a fortunate successful forced landing. In 1946 a similar incident occurred in commercial operation. The cause of these initial fires was determined and corrected, but apparently the extinguishing problem was not solved for we find in 1947 and again in 1950 fatal accidents caused by engine fires which the flight crews were unable to control. Again, last year, there was another such incident, but happily, as in the initial ones, a successful forced landing was made. In this unfortunate and lengthy history there have been several different causes for the initial fires which have been subsequently corrected in each case, but the underlying basic accident cause, uncontrollability, was dealt with inadequately with tragic results.

Another problem which undermined the confidence of pilots who knew the details dealt with propellers. In this instance, after several vivid, but fortunately non-fatal, demonstrations of what happens when a blade snaps, a program was set up to replace the defective type with improved ones over a considerable period of months, a deadline of hours being placed on the service life of the former. Following another incident of in-flight blade failure, this program was accelerated and all of the defective type were out of service in approximately two weeks, as contrasted with the prolonged initial replacement program. The slower program, it developed, had been predicated on the deadline of hours, mentioned previously, which had been based mainly on fiancial considerations rather than on, we think, a conservative technical evaluation of potential seriousness of the already demonstrated hazard.

In cases such as these we feel strongly that intuitive judgment of the situation is often sounder than one based on statistics, particularly when they are financial ones. It is granted that such a judgment is often hard to defend, but the terrific cost to an airline, as well as to the industry in general, of a fatal accident should bear more weight than it often apparently does in high executive circles.

Leaving the design and development aspect of operations, we can logically progress to the actual flying of the equipment by the pilots. Occasionally the statement is heard that the pilots have not progressed with the industry. In this connection it is pertinent to note the increased complexity of airline cockpits. Over the years, the instruments, controls, and gadgets have increased from 289 for the DC-3, to approximately 400 for the DC-4, 522 for the CV-240, some 600 to 700 for the DC-6, to about 1000 for the B-377. Ten years ago how many people had ever heard of V_1, V_2, ADI, TBS, TAI, RMI, VAR, VOR, ILS, Mach limitation, etc? It is granted that the gadgets all have their purpose and have contributed to the increased level of safety, but who can say that they have really made the pilot's job easier? In fact they have greatly increased the chances for confusion and mistakes, and the fact that the percentage of accidents attributed to "pilot error" has not increased with the increased complexity, but has remained relatively constant, is, we feel, proof of the adaptability and professional progress of the pilot group.

Simultaneously with this increased instrumentation and gadgetry has come

(Continued on Page 13)

Mergers:

Recognizing that mergers do occur, ALPA has formed a policy for the solution of pilot problems in such cases. Here is a report on the machinery set up by the Board of Directors.

Leap Year appears destined to do a whopping business in airline marriages if those lines who have indicated their intentions actually follow through. Latest in the series are Capital and Northwest whose respective boards of directors have approved the transaction. Others making overtures, or with commitments more or less definite are West Coast and Empire, Southwest and Bonanza, Braniff and Mid-Continent, Delta with Northeast and National with Colonial.

Some of the merger talk comes as a result of suggestions from the CAB that the smaller lines might well consolidate their overhead and thus streamline their operations. The Board has pointed out that mergers may save some unnecessary route duplication, costs of sales and ticket offices, and excessive overhead charges. In certain cases areas with a community of interest may be linked. In other cases a more economical utilization of equipment may be possible.

While the mergers may solve some of the companies' problems, they create additional ones for the employees. What is to happen to the pilots who are displaced as a result of a merger or an acquisition? The Association's position is that the pilots shall not be injured because of these transactions.

The 5th Executive Board set up a committee to study merger problems. They sent questionnaires to all council chairmen asking for ideas and information. The committee reported that it is not possible to set up a definite, mathematically precise formula by which all mergers should be accomplished. The problems in various mergers, sales and acquisitions are frequently unique. Each must be settled with full regard for the problems peculiar to it.

The committee recommended that machinery be set up for the resolution of seniority questions and other problems which are created by a merger. Acting upon the recommendations of the committee, the 11th Convention set up Association machinery for the resolution of such problems.

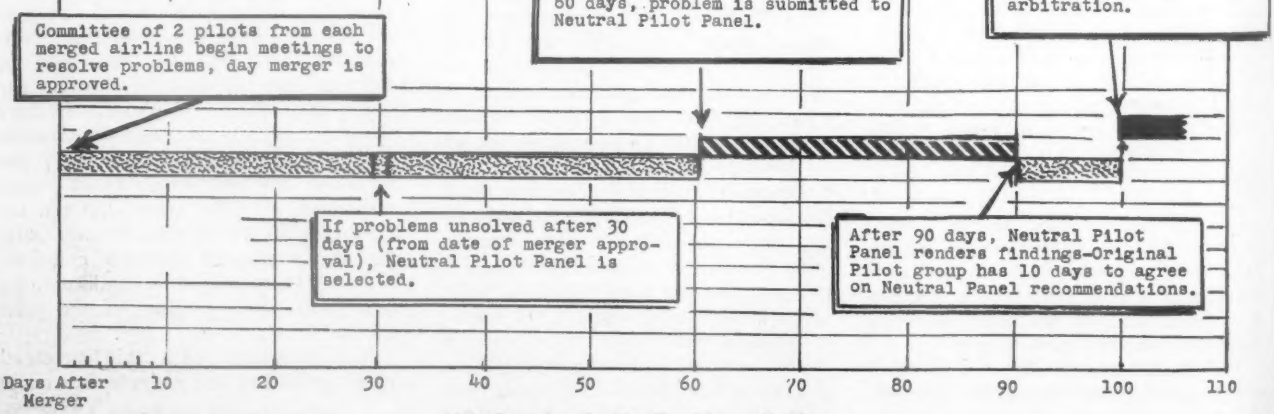
The machinery provides that the pilots of the airlines concerned shall each select two representatives (a captain and a copilot) empowered to act for the respective groups. These representatives act as spokesmen for their respective groups.

As soon as the CAB has acted on the merger, or earlier if the groups agree, meetings are convened of the "representatives" to consider the seniority and any other related problems. If they have been unable to reach a decision within 30 days, or if they still have some unsolved problems, a neutral panel of five pilots from other airlines is then selected as an "Emergency Board" to hear the dispute. If the pilot groups have been unable to agree within 60 days after the merger has been approved, it is then submitted to the neutral panel for hearing. The "Emergency Board" must render its recommendations within 80 days after the merger has been approved. The pilot groups then have an additional 10 days to make an agreement. If they are still unable to do so, arbitration then becomes mandatory.

In the event that it is necessary to resort to arbitration, the four pilot representatives, plus a neutral, shall comprise the arbitration tribunal, and its decision shall be final and binding.

Probably the most important feature of the seniority-dispute machinery, as established by the 11th Convention, is that it provides a means through which these knotty problems can be solved within the Association itself. Obviously the air line pilots themselves know more about air line seniority than does any outside group.

By settling their differences through the ALPA machinery the pilots may avoid having some outside agency direct a seniority integration which might not take into consideration some of the problems involved. And when the respective pilots present a united front on the matter, the Association is in a strong position to press for suitable employee protective conditions through the CAB, or through collective bargaining under the Railway Labor Act with the merged company.


Committee of 2 pilots from each merged airline begin meetings to resolve problems, day merger is approved.
If original group at odds after 60 days, problem is submitted to Neutral Pilot Panel.
After 100 days, problems are submitted to arbitration.
If problems unsolved after 30 days (from date of merger approval), Neutral Pilot Panel is selected.
After 90 days, Neutral Pilot Panel renders findings-Original Pilot group has 10 days to agree on Neutral Panel recommendations.
Days After Merger
10
20
30
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100
110

ALPA Procedure for Handling Merger Problems

A Non-skid Brake

Here is the story on a non-skid brake which ALPA's Engineering Department says, "makes braking action more effective and thereby prevents possible 'over shoot' type accidents." A mailing has gone out urging MEC Chairmen to suggest the device to Management.

ALPA'S Engineering and Air Safety Department is currently plugging for airline testing of a new non-skid braking device.

In a letter to Council Safety Committee Chairmen, the department suggests that MEC Chairmen be urged to discuss the device with the company with the objective in mind *"of having at least a test installation made of this device which makes braking action more effective and thereby prevents possible 'over shoot' type accidents."*

The Department indicates it has *"looked into this device carefully* and finds it has the necessary "fail safe" factor — Should the non-skid device fail, the pilot still has the effect of regular wheel brakes.

Operation

The system accomplishes non-skid braking through an automatic brake releasing device which controls the brakes in the event of excessive pressure applied by the pilot. A flywheel is used to control an electrical switch which remotely controls the hydraulic pressure going to the brake shoes. As the flywheel slows down, brake pressure is released. As the flywheel speeds up, brake pressure increases. This cycling quickly stabilizes to a constant pressure, holding the brake at or near the non-slip speed.

The corrective action over excessive brake pressure is accomplished by a pressure control system which automatically reduces the pressure below the skid-producing level in stops and then allows a gradual increase in pressure to afford maximum braking as the airplane wheel load increases.

Even if full brake pressure is applied before touchdown, the pressure is held released until the wheel has contacted the runway and has come up to speed. This is accomplished with either of two methods.

For aircraft which settle their wheels firmly on the runway within a few seconds after touchdown, the brakes

M. E. Heflinger

are released by a relay which goes into action in flight as the gear is extended, and then becomes unarmed as the wheel reaches to full speed. A short delay in allowing brakes to be applied is used to insure that the wheels have set down firmly and will continue to rotate.

For airplanes such as those with tricycle landing gears where the rear wheels can lift free of the runway for a longer time if braking is initiated at touchdown, the locked wheel detecting system is used to release the brakes. To give this action, a speed-sensing signal releases the brakes anytime the wheel stops while the airplane itself still has forward motion. However once the airplane has been braked to a stop, the signal becomes ineffective and the brakes will continue to hold when the airplane is parked.

Mailing

Included in the mailing to Safety Committe Chairmen is a letter from Captain M. E. Heflinger, ALPA Engineering Rep. of UAL Council 57, Los Angeles. The letter is addressed to J. A. Herlihy, Vice-President of Engineering and Maintenance of United and urges testing of the non-skid brake.

Says Heflinger: "there have been ... references regarding proper braking techniques and damage to aircraft brakes and tires. As a pilot I am fully aware that it is possible to abuse and misuse the brakes. I am also aware that a great deal of our braking damage can be completely unintentional. The larger the aircraft the more pronounced this possibility. For over a year a device has been approved by the CAA that will completely eliminate the possibility of damaged tires due to skidding. It will insure a greater safety margin in that we all know a blown tire means practically no braking."

Northwest Test

Captain Heflinger referred to a Northwest Airlines test of the non-skid brake on their Stratocruisers: "Northwest recently announced in *AVIATION WEEK* that they are going ahead with fleetwide installation, and according to their preliminary findings feel that this device will more than amortize its installation in approximately a year and a half just on reduced tire replacement alone. This doesn't include the added safety gains."

Northwest's decision to install the non-skid braking device was reached after more than 9 months and some 2,000 hours of tests.

The results: Although the device was checked at regular intervals, it required no maintenance. Not a single part was changed during the evaluation program.

Landings made on icy runways indicated that the plane's landing roll compared favorably with landings made on dry concrete runways under ideal conditions without the device. The plane on slick runway landings halted within 50-200 feet of the CAA certified field length for dry run-ways.

Although two-thirds of the tires removed from NWA Boeings during the period were pulled for flat spots, not a single tire was removed for this reason from the newly-equipped plane. The records of the 14 tires used on this aircraft indicated an average life of slightly under 400 hours, and unusually uniform wear. Not a single blowout was recorded. No appreciable scuffing was evident.

The brakes got red hot but continued to operate satisfactorily.

It is reported the new braking system takes some 96 man-hours to install and costs in the neighborhood of $2,500 per unit, plus $200 for installation.

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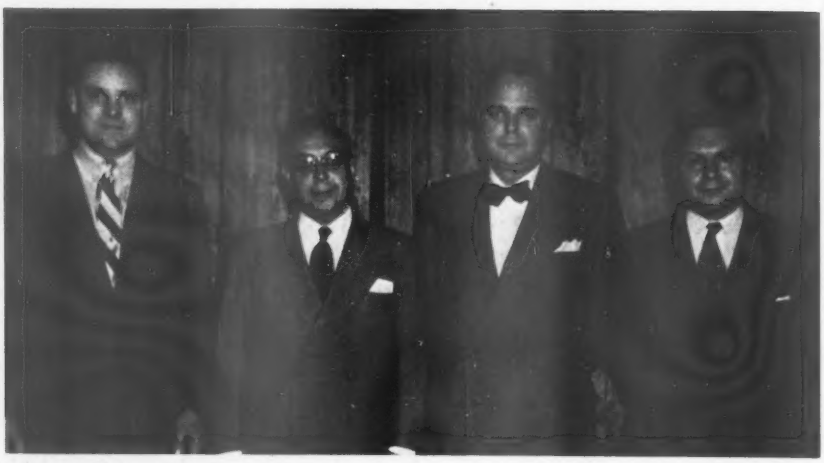

Speakers at the January 24 session of the Institute of Aeronautical Sciences. Left to right, W. W. Moss, PAA (See page 2); Sidney Berman, Directorate of Flight Safety, Norton Air Force Base; Barry G. King, Chief Aero-medical Design Branch, Medical Division, CAA; and Jerome Lederer, Director, Institute of Aeronautical Sciences.

Dinner during the January 29 MEC meeting of TWA members in Chicago.

Over 300 San Francisco-based pilots and their wives attended a banquet February 7. At the speakers table were (left to right) President Sayen, Mrs. Karl Ruppenthal, Washington Representative Larry Cates, and Karl Ruppenthal. ALPA Treasurer Bob Strait (not shown) was also a guest of honor.

At the UAL MEC meeting. Standing (left to right) J. Taylor, 34, San Francisco; M. Berlin, 34, San Francisco; J. Bohl, 33, Denver; K. Benson, 33, Denver; O. Windall, 5, Newark; R. Gibbons, 27, Seattle; H. Dozier, 5, Newark; L. Heacock, 57, Los Angeles; G. Welter, 115, Portland; E. Christensen, 14, Salt Lake; A. Cusumano, 52, New York. Seated (left to right) D. Benster, 27, Seattle; P. Wallace, 12, Chicago; J. Cottle, 14, Salt Lake; H. Anders, 27, Seattle; R. Tuxbury, 52, New York; M. Bedell, 12, Chicago; C. Barnes, 57, Los Angeles.

Hawaiian Airlines pilots gathered to fete Captain Charles Elliott, Superintendent of Operations, after 22 years' service. Captain Elliott was the "first man on the payroll" when the company was formed in 1929. Captain Elliott holds a portrait of himself given to him by fellow pilots.

News

Crash Investigations

ALPA's Engineering and Air Safety Department investigated both the American Airlines crash and the National crash at Elizabeth, New Jersey.

Harry Job, Safety Representative; Jack Durham, Council Chairman, both of AAL Council 22, New York, and Carl Eck, Headquarters, represented ALPA at the scene of the January 22 crash of an AAL Convair-240 at Elizabeth. The accident took 29 lives including three crew members.

Eck reported: ". . . the flight path was determined from radar tracking and seemed normal up to about four and one-half miles from the runway. At this point, the aircraft started to gain altitude and went 150 feet above the path, crossed the course, and started descending. At the 3.5 mile point, the aircraft was 900 feet to the right and on the glide path. At 1400 feet further east, the aircraft crashed after a descent of 910 feet. At this point the plane was 2,100 feet to the right of the ILS course.

"Up to this time, physical evidence has not indicated any malfunctioning. Flaps were 25 and one-half degrees. The gear was not found locked up. It was either down and locked or on the way up. The radios were normal for an ILS approach. The RPM was measured at the governors to be 2230-2240 RPM. The left propeller was at 32 degrees. The right was at 42 degrees."

There are two theories as to the reason for the 42 degree position of the right prop.

Eck said: "The blade could have gone to a higher setting than normal to hold down the RPM during a burst of power; or the prop could have been on the way to or from a feathered position. Of the two possibilities, it seems the former is the more logical."

Eck commented that the press and radio reports of the AAL accident and the earlier Northeast accident at LaGuardia so emphasized the radar record of the accidents that many persons were given the false impression that the two planes were making radar "controlled" approaches, when they were actually making radar "monitored" approaches.

"The AAL crash occurred during an approach on the ILS with minimums of 400 feet and three-quarters of a mile visibility," he said. "The radar controller was monitoring the flight, advising the pilot of his position in relation to the ILS glide path, but the pilot's primary aid was ILS.

"The plane's descent from the glide path to the accident scene was too rapid even to be followed accurately by radar. The radar operator reported losing the target 1,400 feet from the point of crash. The plane's last definitely plotted position was on the glide path."

At LaGuardia: ". . . the plane was also being tracked by radar, but this was surveillance radar which can not be used for an approach aid. No altitude information is given by this type of monitoring.

It is apparent that radar could not be blamed for either accident."

Joint Meeting

Recognizing the mutual concern of both organizations, ALPA and ATA representatives met in Chicago to review the study made of the AAL accident. A general review of airports and landing aids were the subjects of discussion during the two day meeting. Particular consideration was given the New York area.

Attending for ALPA were Walter Jensen, ALPA Air Traffic and Radar Control Committee Chairman, and R. L. Tuxbury, member of this Committee and UAL Master Chairman, Council 52, New York. From Chicago were Captain Robert A. Stone, UAL Council 12, and Ray G. Lloyd, CAP Council 20, both Air Safety Committee Chairmen and members of the ALPA Air Traffic Control and Airway Aids Advisory Committee. T. G. Linnert represented ALPA's Engineering and Air Safety Department.

Those attending for ATA were Sam Saint, Director of Air Navigation and Air Traffic Control Division; Frank White, Landing Aids Engineer; and Craig Timmerman, Operations Division and Regional head of the ATA Chicago office.

A hearing on the AAL crash has been set for March 4, 1952.

National Accident

On February 11, 1952, a NAL DC-6 took off from Newark Airport. It flew for a time at approximately 400 feet, then made a descending pattern to the right and crashed into an apartment building. The crew members killed in the crash were Captain Wayne G. Foster, Co-pilot Carney E. St. Clair, Council 73, Miami, and Engineer Irvin R. Shea. Stewardess Nancy Taylor escaped alive.

Preliminary investigation revealed that the number 3 prop was in reverse pitch when the accident happened and the number 4 propeller was stopped. As a result, a change in wiring connections of DC-6 and Convair planes

At the ALPA-ATA meeting. Left to right, C. Cramer, T. Linnert, W. Jensen, S. Saint, F. White, R. Tuxbury, C. Timmerman, R. Stone, J. Wisda. Not shown, Ray Lloyd.

was ordered by CAB. The change was described as slight and only as an extra safety measure. The change consisted of taking the control wire for the reversible propeller mechanism out of the bundle of wires leading to the engines and putting it into a separate conduit to eliminate the possibility of shorting. The changeover was possible with only a few hours of ground time.

Radio communication indicated that the pilot realized that he had engine trouble and was attempting to bring the aircraft back to the airport at the time of the accident.

The investigation is continuing to determine the cause of the accident. ALPA was represented by NAL captains Charles Ruby, Council 8, Jacksonville, and James Roper, Robert Rohan, and William Archer, Council 73, Miami. Carl Eck of ALPA's Engineering and Air Safety Committee represented Headquarters. Joseph Fluet of the CAB Bureau of Safety Investigation was the investigator in charge. A hearing is slated for March 17, 1952.

Route 68

The attachment of "labor protective conditions" by the CAB as a condition to the sale of a route was upheld by the Circuit Court of Appeals of the United States in an opinion delivered January 31st. The opinion was written by Judge Healy and was handed down in San Francisco. The decision is an important one to all air line employees in that it rules that the CAB has the authority to require that the employees be protected in cases involving mergers, sales, and acquisitions.

The litigations arose out of the sale by Western Airlines of its Route 68 (Denver-Los Angeles) to United Airlines several years ago. Western, in seeking approval of the transaction, submitted to the Board that no employees would be adversely affected by the transfer. Following the Board's tentative approval of the transaction, however, Western furloughed 23 pilots. The Association intervened and requested that the hearing be reopened in order that appropriate employee protective conditions be inserted in the Board's order.

Western argued that its furlough was occasioned by a seasonal slump in business, but the Association showed that it was more than coincidence that approximately 23 pilots would be necessary to fly the four planes which Western transferred to United with the sale.

The Association showed that the sale not only caused junior pilots to be furloughed, but in several instances it caused senior pilots to be displaced to less desirable runs than those they had formerly been flying. The Association maintained that United Airlines should be required to offer employment with full seniority rights to all Western pilots who had formerly operated over the route.

When the Civil Aeronautics Board reopened hearings on the sale, it agreed with the Association that some employees had been adversely affected.

Western challenged the authority of the Board to attach labor protective conditions as a part of its order. Judge Healy's decision upholds the Board's authority.

Walkie-Talkie

Capitol Airlines has installed a walkie-talkie system at its Washington, D. C., headquarters, to give passengers up-to-the-minute information concerning trip operations and, at the same time, speed up repairs, making planes available faster for passenger use.

It is the first time an industrial frequency has been allocated by the Federal Communications Commission for such a use.

With the walkie-talkie system, the ticket agent receives a constant flow of last minute information to give the passengers. A mechanic, working on a plane outside the Company's hangars, relays the latest information and time of readiness to the flight dispatch office. Immediately, the information is turned over to the ticket agent.

The mechanics also use the walkie-talkie to call the maintenance crew chief's office for needed parts, speeding up delivery from the hangar store rooms to the plane under repair and readying it sooner for passenger loading.

Previously, it was difficult to make full information available and speed delivery of repair parts because of the physical set-up of the airport and hangars. Before installation of the walkie-talkie, mechanics making slight repairs on a plane at the edge of a wide ramp outside Capital's hangars had no direct communication with the flight dispatch office

The new hook-up consists of a permanent installation on the ramp, a desk set in the flight dispatch office and another in the maintenance crew chief's office. In addition, there are two mobile hand sets for use by the mechanics when making adjustments inside the plane.

The ramp installation is DC-operated off two six-volt standard automobile batteries and is permanently connected to a motor generator charging plant. The charger is automatically controlled by a time clock, insuring permanent operation of the station. The units in the crew chief's and flight dispatch offices operate on 115 volts—AC current.

Before the walkie-talkie sets were installed application had to be made to the FCC. In petitioning the Commission, Capital explained that a telephone hook-up would not be feasible for it would necessitate tearing up the thick concrete ramp at great expense.

The unique radio set-up operates on 3 watts and radiates power only within a half-mile radius. The new Capital FM station has been assigned a frequency of 154.57 megacycles in the VHF (very high frequency) spectrum.

C-46 Maximum Weight

The Civil Aeronautics Board this month adopted, with the concurrence of the Administrator of Civil Aeronautics, an emergency temporary regulation which will reduce the maximum takeoff and landing weight of the C-46 aircraft used in passenger service to 45,000 pounds. Until the emergency action the maximum weight has been 48,000 pounds. The regulation became effective February 3rd.

The Board viewed its action as part of a program designed to increase safety in the operation of the C-46. CAB reasoned that in view of its findings in connection with operations, pilot proficiency, and maintenance, an additional safety factor should immediately be imposed by the reduction of weight on the C-46.

A proceeding is under way in which the proper maximum weight for C-46 operations is under examination. The position of ALPA at these proceedings as indicated in its brief is; "In the last analysis we must be realistic no matter what the standard flight test data shows; the pilots' experience . . . illustrates conclusively that the C-46 aircraft with a gross weight of 48,000 pounds leaves so slight a margin of safety as to make it non-existent. It is common knowledge among the pilots who fly this plane that in an emergency, under certain conditions, the C-46 gross weighted at 48,000 pounds just may not be expected to perform so as to preclude an incident."

Also in its brief, ALPA made the following recommendation: " . . . the C-46 aircraft gross weight for passenger operation should be reduced to correspond with a rate of climb not less than zero at sea level in the takeoff configuration with the landing gear retracted and the propeller windmilling (as stated in the CAB notice of Proposed Rule Making dated July 6, 1951), and that any increase of gross weight above this figure can be allowed only when it has been demonstrated to the CAA that increased performance of the C-46 aircraft will so permit."

Concurrent with its action, the Board published a Notice of Proposed Rule-

Making which specifically poses the issue whether the Transport-Category requirements of the Civil Air Regulations, with certain modifications should be made applicable to C-46 aircraft. The Board stressed the fact that its emergency action is an interim measure designed to give additional safety to the operation of the C-46 aircraft in passenger service until such time as proper maximum take-off and landing weights can be definitely established. It is proposed that the existing investigation, together with the proposed rule, go forward simultaneously to oral argument as soon as is feasible so that the effective period of the Board's emergency regulation will not be unduly prolonged.

The Board pointed out that it is aware that the reduction in the maximum take-off and landing weights will produce certain adverse economic effects on the carriers who operate the C-46 aircraft in passenger service but pointed out that some C-46 aircraft are presently being operated with a maximum weight of 45,000 pounds and that 45,000 pounds is the weight at which the original certification of the C-46 was made to the Civil Aeronautics Administration. It was further noted, that, by reducing the length of hops, it will be possible for the operators of C-46 aircraft to minimize the loss of passenger carrying capacity as a result of the weight limitation.

ALPA, implementing its policy of a single standard of safety, insists that the same standards apply to the cargo aircraft as the passenger C-46. So far, the CAB has considered only the passenger C-46 issue.

Appointment

Robert N. Buck, Council 24, TWA-International has been named to the Subcommittee on Meteorological problems of the National Advisory Committee for Aeronautics.

Appointment of approximately 400 aeronautical leaders to membership on the 26 technical subcommittees of NACA was announced recently by Dr. J. C. Hunsaker, Chairman.

A prime responsibility of these men is to provide assistance in the formulation of the research programs of the organization. Appointees serve in a personal and professional capacity without compensation. They are scientists from universities, engineers from the aircraft industry and airlines, and experts from the civil and military agencies of the Government most concerned with aeronautics.

Sydney IFALPA Meeting

The Seventh Annual Congress of the International Federation of Air Line Pilot Associations will convene in Sydney, Australia in April.

Approximately twenty-five delegates from sixteen countries are expected, and discussions at the Congress will center on safety, operations, and advancement of the profession.

Testing Fund

A request for $1,620,000 for testing of commercial jet transport aircraft by the CAA is contained in the President's supplemental appropriations request presented to Congress. The bill stresses that the CAA will use the money for testing designed to qualify the CAA and CAB to establish proper certification and operations rules for commercial type jet aircraft. To be tested under the program are the Avro Jetliner, two Douglas F-3D night fighters, and two North American B-45's. The new program has unanimous industry backing.

CAA Field Safety

Consolidation of aviation safety activities under one chief in each of the seven continental regions of the Civil Aeronautics Administration, U. S. Department of Commerce, has been announced.

Concentration of these activities in the field to achieve maximum efficiency will complement the existing Washington Office of Aviation Safety. This action completes a program announced last October 3 and under way for more than a year.

"The main objective of this change is to achieve better coordination of our safety services to the industry and to the public in the field," Administrator Charles F. Horne said. "Another purpose is to make available the services of separate groups of specialists for handling aviation matters as distinct from air carrier and military matters to cope with the rapid technological developments in the field of aviation. In the consolidation, we fitted the best man to the job by making selections from a group of 310 who were qualified by years of experience in aviation safety matters. Personal interviews and written and oral competitive examinations on a strictly scientific personnel administration basis were utilized in making the selections."

Appointed Chiefs of the Aviation Safety Divisions in the Regions are: Region 1, New York, Burleigh Putnam, Jr.; Region 2, Atlanta, Ga., J. M. Leslie; Region 3, Chicago, Ill., J. T. Shumate; Region 4, Ft. Worth, Texas,

Appointments

Cramp

Weiler

Taneyhill

Grigsby

Four veteran pilots of Continental Air Lines have been promoted to executive positions.

J. F. Weiler,, Executive Inactive, has been named director of flying. Weiler, who began barnstorming in 1931 and owned and operated the El Paso Flying Service from 1933 to 1938 joined Continental in 1937. Well-known in the southwest as a professional wrestler, fight promoter and referee, Weiler was made a captain in 1938 and chief pilot in 1942.

Harry D. Taneyhill, Executive Inactive, formerly of Denver, will assume the position of chief pilot of the El Paso division of the airline. Formerly assistant chief pilot in 1949, Taneyhill was first employed by Continental as a co-pilot in September, 1940 and became a full captain in 1942. In his new post, Taneyhill will be in charge of the 33 pilots based in El Paso, who fly the El Paso-Houston segment of the American-Continental Houston to the west coast interchange.

George E. Cramp, Executive Inactive, and R. S. Grigsby Council 15, will alternate at the airline's Denver headquarters as assistant chief pilot. Cramp and Grigsby will be responsible for pilot training, instrument check flights and route check flights. Prior to his affiliation as a co-pilot with Continental in August, 1942, Cramp was a flight instructor with Ray Wilson, Inc. and Mountain States Aviation in Denver; and Wilson Bonfils Flying School in Chickasha, Okla. He also attended Colorado University. Grigsby who attended Colorado State College, was associated with Mountain States Aviation in Denver and he Scott Frying Service in Kingman, Ariz., as an instructor before joining Continental in August, 1942. Grigsby became a captain in 1945.

M. L. Cunningham; Region 5, Kansas City, Mo., R. W. Delany; Region 6, Los Angeles, Calif., W. A. Klikoff; Region 7, Seattle, Washington, D. R. Nelson.

In the Washington Office, two divisions, Airmen and Flight Operations, have been abolished, and two divisions, Air Carrier Safety and General Safety, have been created. E. B. Franklin has been named Chief of Air Safety Division, and E. W. Hudlow, Chief of General Safety Division.

Binding Tape

The Civil Aeronautics Board has tentatively determined that a steep uncontrolled dive which occured to a Capital Airlines DC-4 aircraft enroute from Washington, D. C. to Cleveland, Ohio, on January 26, 1952 may have been caused by the sudden stripping of the doped binding tape from the trailing edge of the left elevator in flight. At the time of the incident the flight had by-passed Pittsburgh because of weather and was cruising in smooth air at 6000 feet.

After landing at Cleveland without further incident the crew was interrogated by safety investigators who reported that the flight maneuver started when the aircraft nosed over suddenly, and, despite efforts to correct the steep dive with elevator tab control, the aircraft continued to nose over as the wheel control column moved forward to its front stop position. The pilot and copilot exerted their combined strength on the aircraft control and brought the ship back to level flight where normal control was resumed. Some 2,200 feet of altitude was lost in the sudden dive.

A thorough examination of the aircraft disclosed that all controls functioned normally and were intact with the exception of the trailing edge of the left elevator. The binding tape, 3 inches in width, is folded over the trailing edge and is doped to the surface. placing 1½ inches of the tape on the top of the surface and 1½ inches on the bottom surface. This binding tape had torn loose on the left elevator for 81 inches outboard of the trim tab of the top surface and for a distance of 40 inches on the bottom surface. 41 inches of binding tape remained on the bottom surface inboard of the trim tab.

The CAB, showed that the binding tape's coming loose and ballooning was sufficient to cause a pitching maneuver but that such ballooning of the tape would have to occur almost instantaneously, this appeared to be the case in the Capital incident.

Since a failure of this sort could affect not only DC-4 aircraft, but other large aircraft of any manufacturer, steps were taken to prevent possibilities of recurrence. The CAB has instructed Capital to complete an examination of their entire fleet in connection with newly-installed doped binding tape on aircraft control surfaces, and has also informed the Air Transport Association of its findings. In addition, the Board has discussed the matter with the Civil Aeronautics Administration of the Department of Commerce which dispatched a telegram to all CAA regions requesting immediate inspection of all large civil aircraft employing this type of taped trailing edge on control surfaces.

ALPA FCU Financial and Statistical Report of January 31, 1952

BALANCE SHEET

Assets

	Jan. 1952
Loans (547)	$290,912.41
Cash	33,816.04
U. S. Bonds	184,420.32
Federal Savings & Loan	
Furniture and Fixtures	2,131.23
Prepaid Expense and Misc.	1,200.20
Total	$512,480.20

Liabilities

Shares	$497,400.12
Reserve for Bad Loans	8,762.71
Undivided Profits	4,421.91
Profit	1,751.95
Accounts Payable	143.51
Total	$512,480.20

STATEMENT OF INCOME & EXPENSE (Year to Date 1952)

Income

Interest on Loans	$ 2,948.48
Investment Income	0
Other Income	0
Total	$ 2,948.48

Expenses

Other Salaries	$ 806.49
Office Supplies	62.24
Educational Expense	29.20
Loan Insurance	225.10
ALPA Reimbursement	0
Depreciation	54.25
Legal and Collection Expense	19.25
Miscellaneous	0
Total	$ 1,196.53
Net Profit	$ 1,751.95

Statistical Information

	Jan. 1952
Number of Members	1,977
Number of Potential Members	9,307
Loans Made Since Organization (Number)	1,563
Loans Made Since Organization (Amount)	$1,002,919.77

In Memoriam

Carney St. Clair

of National Airlines, crashed February 10, 1952, while taking off from Newark Airport.

Wayne G. Foster

of National Airlines, crashed February 10, 1952, while taking off from Newark Airport.

Our sincere sympathy is extended to their wives and families.

In the future, the feature, "In Constant Memoriam," will appear only in designated memorial issues.

Look at Safety—

(Continued from Page 5)

the lowering of minimums and the raising of approach and stalling speeds. Ten years ago the common weather minimum was 500′ and 1 mile and the common approach speed was 90 mph. Today at some fields we find minimums lowered to 200′ and ½ mile while the approach speed has risen to 150 mph. True, the alignment problem is more accurately solved by ILS, but, nevertheless, the time available for the pilot to orient himself properly after becoming "visual" has decreased tremendously from 40 seconds to 12 seconds. In commenting on records which show that under actual 200-½ conditions one of every three approaches is missed, Roe (R. B. Roe, Sperry Gyroscope Corp., 1951) said:

> "This record is no reflection on the professional ability of the airline pilot for he is doing the best possible job with the tools at hand. It does, however, demonstrate graphically the inadequacy of his tools."

We feel that this demonstrates also that minimums of 200-½ are, at this time, not realistic when the human equation is taken into account with the instrumentation and speeds presently provided. In order to correct this, even at the expense of increased cockpit complexity, the addition of an instrument such as the Zero Reader or perhaps automatic approach may be the answer. In this case, even though another gadget is added, the actual task would be simplified and the safety level raised.

Even as cockpits have become more complicated, so have the airway facilities. The number of ranges, ADF beacons, marker beacons, ILS, etc., have nearly saturated many areas. As more accurate fixes and approach systems have been evolved, the increased accuracy has been used to cut approach times and increase the number of aircraft movements, while holding the same level of safety. This, instead of easing the pilot's job, has, in most cases, complicated it further. In a recent fatal accident there is a possibility that the multiplicity of facilities and choice of approach methods may have confused the pilot to the point that the ADF was tuned to the wrong station for the chosen approach method with the result a mass of tangled wreckage on a hillside..

The hitting mountain problem has been with us for many years and the often noted tendency for the fatal lack of terrain clearance to be very small gives rise to speculation as to the number of cases where the safe margin was equally slight. In other words, no one really knows how great is the exposure rate of this type of occurence. Recently an incident happened which shows how easy it is to have a false sense of

orientation. The flight was a long distance one over mountainous European terrain. The forecast wind was badly in error, the actual wind being in the order of a 100 knot headwind instead of 20 knots, so the flight was uncertain of its ETA. Both ADF's were tuned and, although there was considerable snow static, identified on the destination station and the ILS was likewise used. Presently both ADF's reversed, indicating an overhead, and almost simultaneously the ILS needle changed quadrants, confirming the position. The pilot requested and was granted letdown clearance from his 14,000' approach altitude. However, for some reason, before descending he switched frequency and requested a VHF DF fix from the Air Force net in the area. This fix showed his true position to be 75 miles from the station, over mountainous terrain. If he had let down, on what was apparently sufficient proof of his position, there is little doubt that he would have become a statistic in the "pilot error" computations.

The point to be made here is that, unlike a mountain which always knows where it is, a pilot may at times mistake his position or else, as in the above case, receive erroneous indications of his position, and, acting on his best judgment, letdown into a hill or mountainside. This has been amply demonstrated over the years, but little has been done to provide a positive answer to the problem, except for the abortive effort several years ago by the CAB to make a terrain warning device mandatory. Perhaps the order was premature, due to the unreliability of the popular device, but it appeared to the pilots that more effort went into proving that the device was unreliable than in improving it to a practical and useful point. One airline, however, TWA, did work on its terrain warning indicator and now has installed it on a voluntary basis. The author has talked to many TWA pilots concerning this and finds an almost unanimous approval of it.

Perhaps cockpit radar is a more sure and versatile answer, but a practical terrain warning device would eliminate 20% of the fatal accidents causing 25% of the fatalities, and would reduce "pilot error" accidents by 65%. We feel that this is an important area to which industry attention and action should be focused.

In planning design and operations, the average level of competence of the pilot group should be carefully kept in mind. Too often, it seems, operations are planned which require an exceptionally high level of skill and are not realistic in that, while average skill is adequate under normal conditions, trouble is invited under abnormal conditions of airplane malfunction coupled with unfavorable weather. That this is true is easily understood because the executives who do the planning are usually superior in intelligence and experience and have better access to information and naturally plan operations through their own eyes and capabilities. It is, however, a condition which should be guarded against.

Training

An integral part of operations and safety is training. It is obvious that constant training and checking in both old and new procedures is one of the cornerstones of flight safety. However, there is often a tendency to use intensive training to make up for design and operating deficiencies. In regard to this McFarland says:

> "The most promising solution lies in the simplification of the tasks of the air crew rather than in an attempt to improve the quality of the personnel, which is already of a high order in the civil air lines. The relationship between the difficulty of tasks and human performance has been simply expressed by the analogy of a number of people given the assignment of walking a 2 foot wide plank on the ground without falling off. The percentage of human error would be negligible. If the plank were reduced to a 2 inch width and raised a considerable distance off the ground, the number of failures would increase rapidly. Extending the analogy to the simplification of the cockpit, it would be easier to facilitate the task by increasing the width and lowering the height of the plank than to select a group with sufficient skill to be able to walk on the narrower plank higher above the ground."

Frankly, the pilot group feels we are walking a narrow plank.

An interesting training area that has been little explored to date is the use of electronic trainers to determine whether present procedures are straining the flight crew's ability to the breaking point. PAA has made some use of its Dehmel trainer in this light, changing procedures that have resulted in "crashes" of the trainer, but to date no effort has been made to put a coordinated and well planned research program along this line into effect. The results could prove very useful.

The use of intensified training at this time in an attempt to improve the airline safety record should be, we think, only an interim measure until such time as planes and operations are simplified to the point where they are more compatible with human ability.

Regulation

The final facet in the air safety picture is regulation, having implications in all the previous fields, design, operations, and training. Although there is often the cry of "overregulation," clear thinking people will, the author believes, admit that it is, at its worst, a necessary evil. The best example of the effects of underregulation is the state of safety among the non-scheduled airlines. Some of these operators have excellent records but there are many who cut the corners of sound practice and the overall record shows the results glaringly.

There is a basic conflict in air transportation between economics and safety. It has often been said that the only 100 per cent safe aircraft is one which never leaves the ground. However, the economics of such would be nil and the problem is where to adjust the meeting point of the conflicting interests. Here is where, oftentimes, it is necessary to have the CAA/CAB as a sort of umpire, balancing economics, safety, and public interest one against the other.

In discussing Figure 2 the apparent influence of CAR 04 on the safety record of modern four engine planes was pointed out. It appears that these regulations have put a minimum floor under the characteristics of these designs while at the same time allowing enough leeway for sound economics. However, this evenness of the safety record suggests a corollary: the planes were tailored to exactly meet the regulatory requirements, in at least several respects. This, though understandable in view of the intense competition among manufacturers, is not exactly desirable for it tends to stifle safety progress. However, competition being the American way of doing things, the situation will probably remain much the same in the future which points to the constant necessity for the CAB to make the requirements ever higher as the state of the art permits.

Much the same situation exists on the airlines in regard to their operating rules, CAR 41 and 61. Here, however, there is discernible a tendency on the part of some lines to conduct their operations on a safety plane above that required by the government agencies. This sometimes puts them at a competitive disadvantage in spite of their higher safety record, since it is as much the other fellow's record as one's own that determines the desire of the public for air transportation. Therefore, the CAB should always be alert to incorporate in the regulations, as applicable to all, those advances of any carrier which raise the level of flight safety.

As inferred above, the regulations should be fluid as well as realistic. Where weak spots show up, the regulations should be modified to cope with them. A recent case in point was the ammendment of the stalling regulations of CAR 04. In this case a regulation that had served well for several years not only became a barrier to new development, but, in the case of one airplane at least, its liberal application

gave rise to a more dangerous condition than the one it was designed to prevent. The regulation, with the support of manufacturers, airlines, and pilots, has now been modified and the condition referred to above is in the process of being rectified.

In providing this fluidity, the annual Airworthiness Review of the CAB Safety Bureau is extremely important. Although some dissenting opinion on this subject has been heard from industry quarters, the pilots feel that this is the right way to go about the problem. Incidentally, at the most recent meeting in August, 1951, the pilots were very pleased with the reception that was accorded their points of view and we would like to take the opportunity to assure the industry that this was not a flash in the pan effort. Sayen (C. N. Sayen, A. L. P. A. President, 1951) has said:

"The pilot's welfare is tied to the safety and dependability of the operation of his aircraft. A large part of the activity of ALPA must, therefore, be devoted to doing all possible for an increased standard of air safety. If there is a malfunction of any of the complex component parts which make up the modern aircraft, the airline pilot is the first one who will be cognizant of such defects and who may suffer from their inadequacy or malfunctioning. He must, then, be in a position to make his voice heard on such matters and he must be a powerful and independent spokesman in the field of air safety."

Conclusion

In this paper the author has tried to show the great importance of airline safety to the sound and rapid development of this still growing industry and to point out some areas where improvement can be readily made.

Airline safety is influenced by many factors, but it appears that the human limitation factor is the one offering the best chance for improvement of the presently stabilized record, not by more severe selection or training, but rather by designing operations and equipment to more adequately conform with human ability.

By implementing the three suggestions, mandatory reverse pitch, "shoe strings and rubber bands," and a terrain warning device, it appears likely that fatalities could be cut 25 per cent, accidents by 20 per cent, and "pilot error" accidents by 40 per cent. In these cases, human limitations would remain the same, but the tools would be designed to overcome them.

The pilot's success in flying the plane is, after all, the ultimate test of all safety efforts. As Sayen has said, the pilot is the first to know when things go wrong and he can often in advance sense the chance of things going wrong.

The Facts Are These

Pilot Pay Rates

Wage Board Approval

The question which has been asked thousands of times daily by pilots; "When is the Board going to get off their upholstered chairs and do something about approval of pilot pay rates" has at last been answered. The first eight pilot agreements submitted to the Wage Board for approval were signed without change Friday, February 29. The 8: AAL, CAP, C&S, CAL, EAL, TWA, UAL, BNF. In all fairness, the application and mastery of detail required in digesting the various issues involved in a pilot agreement was not like eating candy. The change from flat salary to increment pay for copilots with the incidental increase, percentage-wise to copilots' compensation from this change resulted in a great deal of intricate and involved documentation and study. As further explanation of the delay it must be remembered that Eastern Airlines' contract was the first to be submitted to the Board for approval in point of time. Because it was the first to break the ice, it was felt by many that it might be a poor policy for the RAWB to use this lone contract as a basis of analysis and formation of a pattern. Consequently, actual consideration of the pilot wage case was held up until early in December by which time eight, more or less, typical contracts had been submitted for approval. The wisdom of such group consideration should be obvious in spite of the delay entailed. Counting time lost due to holidays this package has taken about eight weeks.

Pilot Position

Be that as it may, the pilots are, whether they realize it or not, in a far more favorable position than almost any other group seeking approval of pay increases. In the first place the general Wage Stabilization Board and other boards of similar nature are of a tri-partite composition, i.e., they have members who are representative of labor, management and public. This "tri-partite" setup, designed primarily to insure democratic participation results, in the main, in considerable slowdown. For example, in a recent article in the International Teamster, Daniel J. Tobin, president of the teamsters' union, who incidentally is fighting for a separate wage board for teamsters similar to the RAWB, claims there are 15,000 teamster cases alone jammed up before the WSB and that six months is not uncommon for the time lag involved requiring approval.

The general wage and price freeze effectuated by the Defense Production Act of 1950 was amended in September of 1951 to provide for a special Railroad and Airline Wage Board charged with the authority to review and approve policies necessary to carry out the stabilization program with respect to employees covered by the Railway Labor Act. As is common knowledge by this time, the wages and economic fringe benefits contained in air line pilots' working agreements come under the jurisdiction of this Railroad and Airline Wage Board, commonly called RAWB. This Board is composed of three members appointed by the Economic Stabilization Administrator and the present Board is composed of: Nelson M. Bortz, Chairman (formerly Chief of Industrial Relations Division, Bureau of Labor Statistics); Walter T. Nolte, Chief of Litigation Branch, Office of Alien Property in the Department of Justice; and Francis A. O'Neill, Jr., member of the NMB. The Chairman of the RAWB has authority to administer the wage regulations, orders and decisions, to make rulings thereon, etc.

Backlog

The RAWB upon taking office inherited some 300 cases as a backlog. At present, their backlog is somewhat less than this number indicating that new submissions are not gaining headway on cases which have been certified by the Board. By way of contrast, it is estimated that over 25,000 cases have been submitted to the general Wage Stabilization Board. Though the RAWB acts as an autonomous body the signature of the general administrator, Roger Putnam, is required before final activation can take place. Monday, February 18, eight of the first pilot cases submitted to the Board were certified for Mr. Putnam's signature. These eight cases have now been acted upon and a pattern for the industry is established. Future submissions to the Board, having this precedent before them should require only two or three weeks for approval providing they are not extreme in nature. Next year, of course, is another problem.

—Ronald L. Oakman

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This advertisement was approved by representatives of management, labor and the public